

Earth Science Enterprise

Mission

The Earth Science Enterprise (ESE) mission is to understand the total Earth system and the effects of natural and human-induced changes on the global environment. The programs of the ESE advance the new discipline of Earth System Science, with a near-term emphasis on global climate change. Both space and ground-based capabilities yield new scientific understanding of Earth and practical benefits to the Nation. The research results will contribute to the development of environmental policy and economic investment decisions. The ESE mission includes the development of innovative technologies to support Earth Science programs and make them available for solving practical societal problems in agriculture and food production, water resources, and national resource management that provide benefits to the Nation. Knowledge and discoveries will be shared with the public to enhance science, mathematics, and technology education as well as increase the scientific and technological literacy of all Americans.

Implementation Strategy

The ESE conducts global and regional research requiring the vantagepoint of space. New programs will be developed and deployed through the "faster, better, cheaper" approach. Program managers are encouraged to accept prudent risk, shorten development time of technologies and missions, explore new conceptual approaches, streamline management, and incorporate innovative methods to enhance efficiency and effectiveness. Programs of the ESE contribute to the U.S. Global Change Research Program (USGCRP) and are conducted in collaboration with ten other U.S. Federal agencies and 13 nations. Cooperative research programs with national and international partners will continue to play a key role in the implementation strategy of the ESE.

The same spirit of innovation that embodies the Earth Science flight programs applies to technology development. Long-term, high-risk, high-payoff technologies are key to implementing the Earth Science mission. The ESE priorities feature near-term product milestones on a path of long-term inquiry. Obtaining data from the private sector is an emerging feature of the ESE strategy. This will reduce Agency costs and encourage the growth of the commercial remote-sensing industry.

ESE's first Science Research Plan, published in 1996, laid out a strategy for study in five Earth system science areas of maturing scientific understanding and significant societal importance: land-cover and land use changes; short-term climate events, natural hazards research and applications; long-term climate change research; and atmospheric ozone research. The plan also outlined some twenty related areas of research, which underlie these themes and round out the Earth Science contribution to Earth system science. The National Research Council (NRC) recognized the complexity of global Earth environment issues, the multiplicity of interactions between component processes and the cross-disciplinary connections they evoke (Research Pathways for the Next Decade-Overview; NRC, 1998). In the face of such complexity, the NRC outlined a diversity of unsolved scientific questions that call for further study, but also emphasized the need for a focused scientific strategy, concentrating efforts and resources on critical scientific problems that are most relevant to national policy issues. Responding to the latter recommendation, the ESE is pursuing a targeted research program, focused on an updated set of specific science questions that can be addressed effectively with NASA's capabilities, and formulating comprehensive research strategies that can lead to definitive scientific answers, as well as effective applications for all citizens.

The key research topics studied by NASA's ESE fall largely into three categories: forcings, responses, and the processes that link the two and provide feedback mechanisms. This conceptual approach applies in essence to all research areas of NASA's Earth Science program, although it is particularly relevant to the problem of climate change, a major Earth Science-related issues facing the countries of the world. The ESE has articulated a set of science questions which its observational programs and research, modeling, and analysis activities are directed at answering.

How does the Earth change naturally?

What are the primary forcings of the Earth system by human activities?

How does the Earth system respond to natural and human-induced changes?

What are the consequences of changes in the Earth system for human civilization?

How can we predict the changes in the Earth system that will take place in the future?

These questions will be addressed by a research community organized around science disciplines reflecting Earth system components undergoing and responding to change (e.g. the chemistry of the atmosphere and the biogeochemistry of the global carbon cycle).

Enterprise Resource Requirements

The President has requested the following budget for FY99 to FY05 to support the accomplishment of ESE goals:

| | <u>FY 1999</u> | <u>FY 2000</u> | <u>FY 2001</u> | <u>FY 2002</u> | <u>FY 2003</u> | <u>FY 2004</u> | <u>FY 2005</u> |
|--------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| RY\$M | 1,414 | 1,443 | 1,406 | 1,333 | 1,293 | 1,303 | 1,306 |
| CS FTE | 1,365 | 1,382 | 1,419 | 1,424 | 1,417 | 1,431 | 1,436 |

Performance Measures

Goal: Expand scientific knowledge by characterizing the Earth system.

Objective: Successfully launch spacecraft.

- Target: The ESE will successfully develop, have ready for launch, and operate instruments on at least two spacecraft within 10 percent of their schedules and budget to enable Earth Science research and applications goals and objectives. 1Y1

Goal: Disseminate information about the Earth system.

Objective: Implement open, distributed, and responsive data system architecture.

The dissemination of information resulting from Earth Science research is accomplished through the Earth Observing System Data and Information System (EOSDIS), and will continue to be a high priority in FY01. Distribution systems will be improved and new methods will be developed to place data in the hands of Earth Science customers in a timely manner through open, distributed, and responsive data system architectures.

Performance target will be to:

- Target: Successfully disseminate Earth Science data to enable our science research and applications goals and objectives. Indicators of this activity will be to increase by 20 percent the volume of climate data archived over the FY00 target of 368 terabytes, increase the number of products delivered from the DAAC archives by 10 percent over FY00, and make the data available to users within five days. 1Y2

Goal: Expand scientific knowledge by characterizing the Earth system.

Objective: Understand the causes and consequences of land-cover/land-use change - determining how land cover and climate changes affect agricultural productivity and terrestrial and marine ecosystem health.

The carbon cycle is one of the major Earth system processes influencing global climate. NASA research on the biology and biogeochemistry of ecosystems and the global carbon cycle aims to understand and predict how terrestrial and marine ecosystems are changing. This research theme addresses ecosystems as they are affected by human activity, as they change due to their own intrinsic biological dynamics, and as they respond to climatic variations and, in turn, affect climate. Emphasis is on understanding the processes of the Earth system that affect its capacity for biological productivity and the role of the biosphere in Earth system function. Understanding the distribution and cycling of carbon among the active land, ocean, and atmospheric reservoirs constitutes a major scientific focus for research.

The performance targets will be to:

- Target: Explore the dynamics of the global carbon cycle by developing, analyzing, and documenting at least three multi-year data sets. An example of this will be developing a global time series of phytoplankton biomass and primary productivity in the oceans. 1Y3
- Target: Explain the dynamics of global carbon cycle by building improved models and prediction capabilities. One indicator of this activity is improving ecological models needed to predict ecosystem responses to global environmental changes by 15 percent. 1Y4

Objective: Predict seasonal-to-interannual climate variation - determining how water cycles among land, oceans and atmosphere and its impacts on fresh water availability.

Ascertaining the rate of cycling of water in the Earth system, and detecting possible changes, is a first-order problem with regards to the issue of renewal of water resources. Current ESE program activities in this area are; establishing the existence (or absence) of a trend in the rate of the global water cycle, investigating the relationships between large-scale climate anomalies and weather patterns, and accurately representing the integrated effect of water vapor absorption and clouds in a way that is suitable for use in models of climate. The overarching goal is to improve the understanding of the global water cycle to the point at which useful predictions of regional hydrologic regimes can be made. This predictive capability is essential for practical applications to water resource management and for validating scientific advances through the test of real-life prediction.

In FY01 the ESE will continue to invest in observations, research, data analysis, and modeling in this area. The Tropical Rainfall Measuring Mission (TRMM), launched in 1997, will continue to gather information on rainfall in the tropics where two-thirds of global precipitation falls. This is the key to understanding Earth's hydrological cycle, one of the three major processes driving climate change and the global heat balance which drives seasonal change. Current uncertainty in global tropical rainfall estimates is 50 percent; TRMM data will reduce this uncertainty to 10 percent, an 80 percent improvement.

The performance targets will be to:

- Target: Explore the dynamics of global water cycle by developing, analyzing, and documenting at least one multi-year data set such as that needed to obtain accurate maps of the sunrise to sunset changes in precipitation. 1Y5
- Target: Explain the dynamics of global water cycle by building improved models and prediction capabilities, specifically improving current understanding of the large-scale effects of clouds in climate. 1Y6

Objective: Detect long-term climate change, causes, and impacts - understanding, modeling and predicting near and long-term climate variability at global and regional scales.

Climate is not perceived as a static property of the environment any more, but rather a dynamic state that is expected to evolve in the future. This research theme focuses on the modes of variability that involve in a fundamental way the dynamics of the slower components of the physical climate system, the ocean circulation and the mass balance of polar ice sheet. These components respond to disturbances with greater inertia, and therefore longer "memories", than the atmosphere. Currently the ESE research

seeks to; understand the mechanisms of climate variability and predict future transient variations, assess the response of the Earth climate to changes in external forcing factors or surface boundary conditions, and assess the current mass balance of polar ice-sheets and potential future changes, including effects on sea level.

The performance targets will be to:

- Target: Explore the dynamics of long term climate variability by developing, analyzing, and documenting at least two multi-year data sets. An example is continuing the high precision, multi-decadal record of total solar irradiance, providing a quantitative understanding of the solar forcing effects on Earth's climate. 1Y7
- Target: Explain the dynamics of long term climate variability by building improved models and prediction capabilities. One example of this activity will be demonstrating experimental seasonal climate predictions by using next generation super computing systems and new-coupled air-ocean-land-ice models. 1Y8

Objective: Understand the causes of variation in atmospheric ozone concentration and distribution - monitoring and predicting how atmospheric composition is changing in response to natural and human-induced factors.

Atmospheric change is the result of strongly interactive chemical and physical processes. Chemistry plays a role in determining weather and climate, while the physics and dynamics of the atmosphere influence chemical processes and composition. The goals of the Atmospheric Chemistry Research Program are to measure and understand how atmospheric composition is changing in response to natural and anthropogenic forcings, and enable accurate prediction of future changes in ozone and surface ultraviolet radiation, climate forcing factors, and global pollution.

The performance targets will be to:

- Target: Explore the dynamics of atmospheric composition by developing, analyzing, and documenting at least three multi-year data sets, such as providing continuity of multi-decadal total ozone concentration measurements. 1Y9
- Target: Explain the dynamics of atmospheric chemistry by building improved models and prediction capabilities. One example of this activity will be characterizing the atmospheric plume flowing out of East Asia, its evolution as it transits eastward over the Pacific, and its contribution to global atmospheric chemical composition. 1Y10

Objective: Identify natural hazards, processes, and mitigation strategies - discovering the nature and processes of the Earth's dynamic interior and crust to better prepare for natural hazards.

The long-standing Earth Science Research Program in fundamental solid Earth Science explores issues such as the dynamics of the Earth's interior and crust, tectonic motions, earthquakes, volcanic eruptions, and the evolution of landscapes. Results of this and other relevant activities are developed and applied to the assessment and mitigation of natural disasters for the practice of disaster management, working together with practitioners at the international, federal, state and local levels. Through the development of technologies designed to observe and understand the Earth, the ESE possesses an inventory of observational capabilities and techniques which can be developed and applied to understanding natural hazards, characterizing natural disasters, and monitoring conditions that may lead to such events.

The ESE will use a combination of space-based and airborne assets to monitor and assess impacts of natural hazards such as volcanoes, earthquakes, forest fires, hurricanes, floods and droughts. The short-term objective is to assess impacts of these events on national and international agriculture, food production, water resources, commerce, etc. The long-term objective is to apply the scientific understanding toward developing a predictive capability.

In FY01 the ESE will continue to provide the technology and instruments to allow collection of interferometric Synthetic Aperture Radar (SAR) data. This will enable the first consistent global topography data record collected from space, and will have a variety of applications including flood hazard assessment, laying out new roadways and pipelines, and providing airline operators with detailed elevation data for remote areas.

The performance targets will be to:

- Target: Explore the dynamics of the Earth's interior and crust by developing, analyzing, and documenting at least one multi-year data set such as analysis of 30 meter topographic data for global geological and geomorphic process studies and improved mapping of terrain features. 1Y11
- Target 1Y12: Explain the dynamics of the Earth's interior and crust by building improved models and prediction capabilities. An indicator of this activity will be providing a basis for future tectonic modeling and earthquake vulnerability assessment through completion of the Southern California Integrated GPS network. 1Y12

Goal: Enable the productive use of ESE science and technology in the public and private sector.

Objective: Develop and transfer advanced remote sensing technologies.

In collaboration with partners in industry and academia, the ESE will develop and demonstrate new technologies of value to remote-sensing research.

The performance target will be to:

- Target: Achieve success in timely development and infusion of technologies. This will be accomplished by formal technology readiness assessment of critical technology essential for implementing proposed mission concepts. The Technology Readiness levels (TRLs) will be such that the mission development cycle can be accomplished within a 3-year cycle. This activity will enable future science missions by increasing technology readiness for mission concepts to reduce their total cost. An example indicator is the transfer at least one technology development to a commercial entity for operational use. 1Y13

Objective: Extend the use of Earth Science research for national, state, and local applications.

Because the ESE addresses science questions of societal importance, the research performed also leads to practical applications. ESE works with National, State, and local government entities to help them develop remote sensing applications products to address issues of importance to them. These include agricultural productivity, natural resources management, as well as urban and regional planning.

The performance targets will be to:

- Target: Provide regional decision-makers with scientific and applications products/tools. An example indicator is an effort with USGS, to produce a new Landsat-7 based map of each of the 50 states for their use in communicating geographic information. 1Y14
- Target: Improve access to and understanding of remotely sensed data and processing technology. An example indicator is putting on informational workshops in using Earth Science observations and information involving at least 20 states. 1Y15

Objective: Support the development of a robust commercial remote sensing industry.

NASA is committed to a growing relationship with the commercial remote sensing industry to enhance the utility of Earth Science information in the U.S. economy. Commercial firms are both potential sources of science-quality remote sensing data, and producers of “value-added” information products from U.S. research satellites.

The performance targets will be:

- Target: Stimulate the development of a robust commercial remote sensing industry. An example indicator is developing ten new commercial products in joint commercial applications research projects. 1Y16
- Target: Increase efficiencies in food and fiber production with the aid of remote sensing by conducting at least 20 joint applications research endeavors in conjunction with the U.S. Department of Agriculture. 1Y17

Objective: Increase public understanding of Earth System through education and outreach.

Earth Science missions and research programs make a unique contribution to education and the public understanding of Earth Science. They provide a steady return of discoveries and new knowledge contributes to the accomplishment of this objective. The ESE will continue to sponsor research awards through NASA's Graduate Student Research Program.

The performance target will be to:

- Target: Increase public understanding of Earth system science through formal and informal education. The ESE will continue and improve upon prior year performance in the areas of graduate research and education grants, K-12 teacher workshops, and participation in GLOBE. 1Y18

Objective: Make major scientific contributions to national and international environmental assessments.

Because of the nature of the discipline, it is vital that Earth Science research be conducted through cooperation and partnerships with other agencies and with other countries. The ESE will continue to contribute scientific knowledge and observations and modeling results to national and international scientific environmental assessments. The targets for this objective are embedded within targets in other program areas.

Internal Assessment

The Earth Science Enterprise will regularly review performance objectives as part of our existing monthly review process. Using a database to track current performance monthly for each specific FY01 target will enable the Enterprise to focus on targets that need improvement. ESE management will institute measures to ensure improvement.

As ESE is a scientific endeavor, many of its measures involve scientific results. These are subject to peer review, both in the selection of the science investigation, and in the reporting of findings in the scientific literature. Where the metric is production of a data product, these must be archived in ESE's information system, where their availability can be confirmed via an Internet query. Metrics addressing scientific assessment activities result in formal, published reports that are readily identified.

External Assessment

The Earth Science Advisory Committee of the NASA Advisory Council will conduct an annual assessment of the ESE's near-term science objectives. The Committee will provide a qualitative progress measurement (Green, Yellow, or Red). "Green" will indicate that the objective was met; "Yellow" will indicate a concern that an objective was not fully accomplished; and "Red" will indicate that events occurred that prevented or severely impaired the accomplishment of the objective. The assessment will include commentary to clarify and supplement the qualitative measures.

Earth Systems Science and Application Advisory Committee (ESSAAC) is a committee of the NASA Advisory Council under the Federal Advisory Committee Act, and comprises outside scientific and technical experts from academia, industry, and other government agencies. ESSAAC meets at least twice a year to review plans and progress in the ESE. After the end of each fiscal year, the ESE will provide ESSAAC a self-assessment in each of the relevant objectives, highlighting performance against the metrics in the Performance Plan for that year. ESSAAC will deliberate internally and render its own assessment, which may confirm or modify the ESE's self-assessment. ESSAAC's assessment will be reported in the Performance Report for that year. This process will be repeated annually.

Earth Science FY01 Performance Plan

| Strategic Plan Goal | Strategic Plan Objective | 01 # | FY01 Targets | FY01 Indicators |
|--|--|-------------|---|---|
| Expand scientific knowledge by characterizing the Earth system. | Successfully launch spacecraft | 1Y1 | Successfully develop, have ready for launch, and operate instruments on at least two spacecraft to enable Earth Science research and applications goals and objectives. | Accomplish target within 10% of schedule and budget. At least 90% of the on-orbit instrument complement fully operational. |
| Disseminate information about the Earth system. | Implement open, distributed, and responsive data system architecture. | 1Y2 | Successfully disseminate Earth Science data to enable our science research and applications goals and objectives. | Increase by 20% the volume of climate data archived, increase the number of products delivered from the DAAC archives by 10%, and make available acquired observations and resulting information to users within 5 days of acquisition. |
| Expand scientific knowledge by characterizing the Earth system. | Understand the causes and consequences of land-cover/land-use change. | 1Y3 | Explore the dynamics of the global carbon cycle by developing, analyzing, and documenting multi-year data sets. | Develop, analyze, and document at least three multi-year data sets. |
| | | 1Y4 | Explain the dynamics of global carbon cycle by building improved models and prediction capabilities. | Improve by at least 15% the ecological models and provide information to understand remotely sensed observations. |
| | Predict seasonal-to-interannual climate variations. | 1Y5 | Explore the dynamics of global water cycle by developing, analyzing, and documenting multi-year data sets. | Develop, analyze, and document at least one multi-year data sets. Decrease the uncertainty by at least 20% in determinations of radiation forcing and feedback. |
| | | 1Y6 | Explain the dynamics of global water cycle by building improved models and prediction capabilities. | Complete collection and processing of satellite data needed for the multi-decadal global cloud climatology, validate parameterizations of Earth's radiative processes, and demonstrate the capability to measure and diagnose soil moisture remotely from airborne platforms. |
| | Detect long-term climate change, causes, and impacts. | 1Y7 | Explore the dynamics of long term climate variability by developing, analyzing, and documenting multi-year data sets. | Develop, analyze, and document at least three multi-year data sets. |
| | | 1Y8 | Explain the dynamics of long term climate variability by building improved models and prediction capabilities. | Develop and demonstrate the capability to measure and diagnose open ocean variations in salinity by 0.1 psu. Develop and validate aerosol retrieval and cloud screening algorithms, and processing of satellite data and transport model evaluations. Demonstrate the experimental seasonal climate predictions. |
| | Understand the causes of variation in atmospheric ozone concentration and distribution. | 1Y9 | Explore the dynamics of atmospheric composition by developing, analyzing, and documenting multi-year data sets. | Develop, analyze, and document at least three multi-year data sets. |
| | | 1Y10 | Explain the dynamics of atmospheric chemistry by building improved models and prediction capabilities. | Provide increased prognostic ability for Northern hemisphere high latitude ozone loss, develop the first global climatology of carbon monoxide and total column methane, and characterize atmospheric plume flowing out of East Asia, its evolution, and its contribution to global atmospheric chemical composition. |

Earth Science FY01 Performance Plan

| Strategic Plan Goal | Strategic Plan Objective | 01 # | FY01 Targets | FY01 Indicators |
|---|---|-------------|---|--|
| | Identify natural hazards, processes, and mitigation strategies. | 1Y11 | Explore dynamics of the Earth's interior and crust by developing, analyzing, and documenting multi-year data sets. | Develop, analyze, and document at least one multi-year data set. |
| | | 1Y12 | Explain dynamics of the Earth's interior and crust by building improved models and prediction capabilities. | Improve understanding of geodynamic processes, allow continuous observations, improved data processing efficiency, and reduce operational costs by 20%. Provide a basis for future tectonic modeling and earthquake vulnerability assessment. |
| Enable the productive use of ESE science and technology in the public and private sectors. | Develop and transfer advanced remote-sensing technologies. | 1Y13a-c | Achieve success in timely development and infusion of technologies. Enable future science missions by increasing technology readiness for mission concepts to reduce their total cost. | Advance at least 25% of funded instrument technology developments one Technology readiness level (a). Develop advanced information systems technologies and concepts (b). Develop at least 3 technologies to demonstrate them in space with the third Earth Observer New Millennium satellite (c). Transfer at least one technology development to a commercial entity for operational use. |
| | Extend the use of Earth science research to regional, state, and local applications. | 1Y14 | Provide regional decision-makers with scientific and applications products/tools. | Establish at least a second Regional Earth Science Application Center (RESAC) as a self-sustaining entity. Produce a digital image database of all 50 states once every two years. Develop capability to assess the vulnerability of fishing grounds due to water quality issues. Develop experimental models to demonstrate an ability to improve forecast skill levels. Monitor and predict the track of at least one key atmospheric pollutant species. Develop a prototype air quality assessment. Initiate two Applications Research projects with the public and private sector. Develop a predictive capability for outbreaks of malaria with 50% accuracy in Central Africa. Develop at least two new data products for routine decision-making. |
| | | 1Y15 | Improve access to and understanding of remotely sensed data and processing technology. | Involve at least 20 states in informational workshops to foster applications of remote sensing data and processing technology. Initiate at least 10 joint Application Research pilot projects. Implement at least 10 active student internships at the State and local level. |
| | Support the development of a robust commercial remote sensing industry. | 1Y16a | Stimulate the development of a robust commercial remote sensing industry. | Develop 10 new market commercial products. Identify at least one new commercial source of science. Develop 4 new validated commercial information products. Provide 10 prototype products that quantify the utility of Hyperspectral and Synthetic Aperture Radar (SAR) technologies and define future market requirements. Increase cost share leveraging with companies, academia, and other government agencies by 10%. |
| | | 1Y17 | Increase efficiencies in food and fiber production with the aid of remote sensing. | Conduct at least 30 joint applications research endeavors in conjunction with the U.S. Dept of Agriculture |

Earth Science FY01 Performance Plan

| <u>Strategic Plan Goal</u> | <u>Strategic Plan Objective</u> | <u>01 #</u> | <u>FY01 Targets</u> | <u>FY01 Indicators</u> |
|-----------------------------------|--|--------------------|--|--|
| | Increase public understanding of earth system science through education and outreach. | 1Y18 | Increase public understanding of Earth system science through formal and informal education. | Continue 90 existing grants and award 50 new graduate student research and education grants. Continue 17 early career grants in research/education and initiate at least two new collaborative projects. Conduct at least 400 workshops training K-12 teachers. Increase participating teachers in Global Learning and Observation to Benefit the Environment (GLOBE) to 13,800 and increase participating countries to 87. |

| ESE FY01 | Budget Category | EOS | Earth probes | Operations | Research and Technology |
|---|------------------------|------------|---------------------|-------------------|--------------------------------|
| Performance Target | | | | | |
| Successfully develop, have ready for launch, and operate instruments on at least two spacecraft to enable Earth Science research and applications goals and objectives. (1Y1) | | X | X | X | |
| Successfully disseminate Earth Science data to enable our science research and applications goals and objectives. (1Y2) | | X | | | |
| Explore the dynamics of the global carbon cycle by developing, analyzing, and documenting multi-year data sets. (1Y3) | | X | X | X | X |
| Explain the dynamics of global carbon cycle by building improved models and prediction capabilities. (1Y4) | | X | | | X |
| Explore the dynamics of global water cycle by developing, analyzing, and documenting multi-year data sets. (1Y5) | | X | | X | X |
| Explain the dynamics of global water cycle by building improved models and prediction capabilities. (1Y6) | | X | | | X |
| Explore the dynamics of long term climate variability by developing, analyzing, and documenting multi-year data sets. (1Y7) | | X | | | X |
| Explain the dynamics of long term climate variability by building improved models and prediction capabilities. (1Y8) | | X | | X | X |
| Explore the dynamics of atmospheric composition by developing, analyzing, and documenting multi-year data sets. (1Y9) | | X | X | X | X |
| Explain the dynamics of atmospheric chemistry by building improved models and prediction capabilities. (1Y10) | | X | | | X |
| Explore the dynamics of the Earth's interior and crust by developing, analyzing, and documenting multi-year data sets. (1Y11) | | | | | X |
| Explain the dynamics of the Earth's interior and crust by building improved models and prediction capabilities. (1Y12) | | | | | X |
| Achieve success with timely development and infusion of technologies. Enable future science missions by increasing technology readiness for mission concepts to reduce their total cost. (1Y13) | | | | | X |
| Provide regional decision-makers with scientific and applications products. (1Y14) | | X | | X | X |
| Improve access to and understanding of remotely sensed data and processing technology. (1Y15) | | | | | X |
| Stimulate the development of a robust commercial remote sensing industry. (1Y16) | | | | | X |
| Reduce uncertainties in food and water production that are due to remote sensing. (1Y17) | | | | | X |
| Increase public understanding of Earth system science through formal and informal education. (1Y18) | | | | | X |